



## Enhancing Safflower Production and Product Development for Food Security and Improving Incomes of Small-scale Farmers in Botswana

### Summary

Safflower (*Carthamus tinctorius* L.) is a member of the family Compositae or Asteraceae, cultivated mainly for its seed, which is used as edible oil, birdseed or for its flowers, used as dye sources and medicinal purposes. Safflower is a drought, heat, cold and saline tolerant crop. It is the most drought tolerant oilseed crop and can produce good seed yield in semi-arid regions, while its salt tolerance is a valuable asset as the area affected by some degree of salinity continue to increase world-wide. The safflower crop also tolerates a wide range of temperatures from -15 to 40°C, provided there is no frost during the elongation and flowering phases of growth and development. Alive and non-alive stresses are the factors limiting crop most production, however, drought stress is the most important limiting factor to most crop production in agricultural systems in arid and semi-arid regions such as Botswana. India, USA, Mexico and China are the major producers of safflower (FAO, 2010). Presently, India is the largest producer of safflower in the world, followed by the USA, Mexico, and China (Esendal, 2001; FAO, 2010). India produces 46% of the world safflower production (421,000 tons) mainly for oil production (Rowland, 1993, Esendal, 2001). Mexico is the second largest producer of safflower, mainly producing it for oil production for domestic consumption and export (Bassil and Kaffka et al., 2001; Esendal, 2001). The Botswana farmers can grow safflower for the export or domestic markets.

This CARP project aims at undertaking on-farm safflower research with the goal to: 1) mitigate the effects of climate change in a semi-arid country such as Botswana; 2) improve food security, reduce reliance on food imports and improve income levels of farmers in Botswana through the sale of safflower products such as oil, processed petals, cut-flowers, vegetable and cake after oil extraction for livestock feed, hence reduction in poverty and hunger; 3) improve the livestock sub-sector through the availability of feed (seeds, cake, direct grazing, hay and silage) hence reduction in feed importation, increased farmer income, reduction in poverty and hunger; 4) improve health and well-being of Botswana of all ages through use of safflower oil in cooking, salad dressings, and making baby foods which has plenty of health benefits due to the polyunsaturated and monounsaturated linoleic and oleic fatty acids; 5) promote safflower product development such as cooking oil, biodiesel, cut flowers, animal feed, raw and processed vegetables, herbal teas, pharmaceuticals, etc.

The overall objective of this project is to enhance safflower production and product development with the goal to mitigate the effects of climate change, improve food security, reduce hunger, reduce reliance on food imports, improve income levels of farmers therefore reducing poverty, improve the livestock sub-sector, and improve health and well-being of Botswana of all ages. The specific objectives of the project are to evaluate: 1) safflower genotypes performance for morphological characteristics, seed yield and yield components, oil yield, and composition grown on-farm in four growing sites; 2) safflower nitrogen and phosphorus requirements in different soils under on-farm trials in three growing sites; 3) safflower genotypes suitable for petal production and time of harvesting on petal and seed yield, carthamin and carthamidin content in three growing sites; 4) insect pest status, diversity, population dynamics and their natural enemies plus beneficial insects on five safflower genotypes in three

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**Project ID:**  
RU/2019/CARP+/02

**Project duration:**  
48 months

**Start date:**  
01 June 2019

**Funding**  
RUFORUM

**Total budget:**  
\$300,000

#### Project partners:

- i) Baqrolong Vocational Training Centre
- ii) Tshwarago Brigade
- iii) Farmer Associations
- iv) Department of Agricultural Research, Ministry of Agricultural Development and Food Security
- v) Crop Production Department (Extension Officers) Ministry of Agricultural Development and Food Security
- vi) National Food Technology Research Centre

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growing sites both in winter and summer; 5) the effects of nitrogen fertilizer application on safflower insect pest population dynamics, their natural enemies and beneficial insect; 6) Link the university (BUAN) with Technical and vocational education and training (TVET) institutions; 7) Train 10 TVET students in data collection with the goal of training them in research thus providing them with skills and competencies in data collection; 8) Train farmers in safflower growing, processing, product development and marketing.

The expected outputs of these project are: 1) Five high calibre personnel (one PhD and four MSc holders) including graduate interns and at least 10 TVET students will be trained capacitating agricultural research in Botswana; 2) five or six scientific publications can be published in peer-reviewed journals; 3) five theses (one PhD and four MSc) will be published bound and electronic versions; 4) Extension pamphlets; and 5) Safflower book based on the research findings of this project. While the expected outcomes will be the commercialization of safflower production and increased safflower products development in Botswana, reduction in the importation of cooking oils, improved food security, reduced hunger, improved income levels of farmers therefore reduced poverty, improved livestock sub-sector, and improved health and well-being of Botswana.